

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of: Walton et al.

Serial No.: 10/644,567

Filed: 08/20/2003

For: ELECTRON BEAM ENHANCED LARGE AREA DEPOSITION SYSTEM

Examiner: McDonald, Rodney Glenn

Art Group Unit: 1753


DECLARATION UNDER 37 C.F.R. § 1.132 OF SCOTT G WALTON

I, Scott G Walton, hereby declare that:

1. I am a named co-inventor in the above-identified patent application ("application"). I hold a PhD in Physics and employed as a research physicist in the Plasma Physics Division at the Naval Research Laboratory. I have 10 years of experience in plasma source and materials processing research and presently serve as the principal investigator of the "High Density Plasma Processing with Electron Beam Produced Plasmas" program.
2. The conventional wisdom stated that a higher sputtering rate is desirable to reduce energy requirements, and could be achieved by larger plasma densities, which in turn, could result from larger ion production rates.
3. The attached graph shows the electron impact ionization cross-sections for nitrogen as a function of electron energy. For sputtering, the electron energy was chosen to maximize the ion production rate, which would occur at the maximum ionization cross section. The graph shows that this occurs at about 100 eV.
4. Low energy electrons, such as 40 eV are near the maximum ionization cross sections in most gases and are thus likely to maximize the ion production rate .
5. Increasing the energy to 1 keV decreases the ionization cross section and reduces the amount of plasma formed per length of electron travel, while at the same time causing a greater preference for ionization over excitation. The species generated are different in comparison to convention sputtering as used in Moseson, US Pat. No. 3,393,142. It was found that the different species led to larger grain sizes of sputtered TiN.
6. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that

these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

2/14/2008
Date


Scott G Walton

